UNITED STATES DEPARTMENT OF AGRICULTURE

SYLLABUS 22

Contribution from the States Relations Service
A. C. TRUE, Director

In Cooperation with the Bureau of Animal Industry
A. D. MELVIN, Chief

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ILLUSTRATED LECTURE ON CATTLE-TICK ERADICATION

PREPARED IN THE
BUREAU OF ANIMAL INDUSTRY

CONTENTS

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U. S. DEPARTMENT OF AGRICULTURE,
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SYLLABUS 22—ILLUSTRATED LECTURE ON CATTLE-TICK ERADICATION.[1]

Prepared in the Bureau of Animal Industry.

INTRODUCTION.

View.

In the early history of the cattle industry in the West it was found that great losses occurred from the disease variously known as Texas fever, splenic or splenetic fever, red water, etc., and that this disease occurred when cattle from the South were moved north to other localities. The southern cattle apparently carried the disease which caused the death of the cattle in the localities to which they were moved, while at the same time the southern cattle did not appear to be affected. The death of northern cattle also resulted when they were taken south.

These losses prompted the study of the disease by many scientific men, whose investigations soon established the great danger of allowing southern cattle to pass into the Northern States during warm weather, and resulted in 1885 in the location of the infected district and in the establishment of the Texas-fever quarantine line in 1891. It was observed that the southern cattle carried ticks on them, and this led to suspicion that the ticks had something to do with the disease. Experiments by the Bureau of Animal Industry demonstrated in 1891 that the disease was carried by these ticks.

When it was determined how this disease was carried, and that it was carried by the tick, regulations were issued to prevent the spread of the disease. In order to restrict the distribution of the tick the National and State governments

[1] This syllabus has been prepared in the Bureau of Animal Industry, in cooperation with J. M. Stedman, Farmers' Institute Specialist of the States Relations Service, and is designed to aid farmers' institute and other extension lecturers in presenting the subject before popular audiences. The syllabus is illustrated with 50 lantern slides. The numbers in the margins of the pages refer to the lantern slides as listed in the Appendix. With this list of slides a few notes are also given in their order, for the aid of lecturers who may wish to refer to them instead of the entire printed text as herein given.

The statistics given are the latest available up to Sept. 15, 1916. The figures of expenditures, areas freed of ticks, etc., are of course subject to change as the work progresses, and the same is true of a few of the slides.

59153—16

View.

maintained a quarantine line extending across the country from the coast line of southern Virginia to a point in the southwestern boundary of Texas, and also taking in a large portion of California. From the quarantined areas cattle may be moved to points outside of the quarantined area only in accordance with the regulations for immediate slaughter, or for other purposes after dipping or inspection and certification. When shipped for immediate slaughter the cars must be placarded "Southern Cattle" and the waybills so marked, and when the cattle are unloaded in transit and at destination they must be placed in pens and yards reserved for such cattle.

THE BEGINNING OF TICK ERADICATION.

After its life history had been ascertained it was found to be practicable to eradicate the tick. As early as 1898 tick eradication was practiced to some extent in North Carolina, and considered practicable; and State live-stock sanitary officials and interested cattle owners urged year after year that State and Federal appropriations be made for the eradication work. The first appropriation by Congress, of $82,500, was made available July 1, 1906, for the use of the Bureau of Animal Industry in cooperation with the State authorities. This appropriation was increased from time to time and for the fiscal year ending June 30, 1917, amounted to $632,400.

When the work of tick eradication was first undertaken it was expected that the cooperation of the cattle owner could readily be had by explaining to him its importance and the benefits to be derived. As a matter of fact, however, as soon as it was shown that restrictions must be imposed on the movement of the cattle to prevent reinfestation, and that it was necessary for the cattle owner to assist by disinfecting his cattle and endeavoring to keep his premises free of ticks considerable opposition was encountered. With the progress of the work and through education and demonstration these obstacles have been largely overcome.

REASONS FOR TICK ERADICATION.

Many kinds of ticks infest cattle, all of which affect the animal as parasites, but the tick known as *Margaropus annu-*
1 *latus* is the one with which we are especially concerned. This is the tick that transmits the disease known as splenetic or Texas fever and necessitates restrictions on the transportation of cattle from the tick-infested area in order to protect the cattle of other parts of the country.

View.

This picture shows a portion of a steer's hide heavily infested with ticks. As these ticks suck the blood of the animal until they become engorged, the large quantity of blood drawn from the unfortunate host by such a multitude of parasites can be readily appreciated. Actual experiments show that when an animal is heavily infested with ticks they will draw as much as 200 pounds of blood from a 1,000 pound animal in the course of a year. This enormous drain keeps the animal in poor condition, and the blood that should go to make meat and milk goes to feed the ticks. So we have strong reasons for exterminating the ticks; they are disease carriers, and they are blood-sucking parasites. 2

LIFE HISTORY OF THE CATTLE TICK.

Any method looking to the eradication of the tick must be based on the life history of the parasite. Let us begin at the point where the fully developed and fertilized female, about one-half inch in length, engorged with blood and ready to lay her eggs, loosens her hold on the cow and drops to the ground. Upon reaching the ground she seeks a sheltered place, and before beginning to deposit her eggs, may lie quietly for a period varying from 2 to 98 days, depending upon climatic conditions. Egg laying is completed in from 4 to 151 days, this period, likewise, depending upon climatic conditions. The number of eggs laid by the female tick varies from a few hundred to more than 5,000. As egg laying proceeds the tick becomes smaller and smaller, finally shriveling to a fraction of her former size, and, having fulfilled her mission, soon dies. In the eggs, which are light brown and waxy in appearance, the larvæ, or seed ticks, develop, the time required for this process varying from 19 to 188 days, according to conditions of temperature, moisture, etc. 3 4 5

It is commonly supposed that freezing weather is sufficient to destroy the ticks and tick eggs which may be on the ground, but this is not necessarily true. The temperature must be considerably below the freezing point before it has any pronounced effect in killing ticks or eggs. Much also depends upon whether the ticks and eggs are exposed to the weather or are protected. A temperature of 23° F. destroys many engorged ticks on the ground if they are not protected from the weather; a temperature of 14° F. destroys all of them. When, however, they are protected with dry chaff or similar material, they will withstand a temperature as low as 12° F. Unprotected eggs are destroyed at a temperature of 4° F., and

View.

unprotected seed ticks at a temperature of 2° F. If protected with dry chaff or similar material, eggs and seed ticks both withstand temperatures considerably lower.

The larvæ, or seed ticks, are very small compared with the full-grown ticks. They measure only about one thirty-second of an inch in size, are provided with three pairs of legs, and crawl actively about on the ground and among leaves, not going more than a few feet from the place where they hatched. They climb up the nearest grass blade, fence post, etc., and bunch near the top to await an opportunity for attachment to a passing host. If they do not succeed in attaching themselves to a host, these larvæ or seed ticks can live for three or four months in warm weather, and for as long as eight months when the winter is included. Until they become attached to a host they have no nourishment except that stored up in their bodies while they were in the egg stage. Their natural food is the blood of cattle, though they occasionally attach themselves to other animals; and without the blood of a host they can not develop to maturity and produce another generation. When they find cattle, they fasten themselves to the skin and begin drawing blood. The ticks may cause fever at this stage, although they are so small as scarcely to be detected by the naked eye. After being on the animal from 7 to 12
6 days the seed tick, which meanwhile has increased in size, molts or sheds its skin and emerges as the so-called nymph, which is considerably larger than the seed tick and has 8 legs instead of 6.

During the nymphal stage the tick again increases in size, and at the second molting, 5 to 11 days later, it emerges as a
7 sexually mature male or female tick. The male and female at this stage are about the same size. Mating now takes place.
8 The male tick does not increase materially in size, but the female after mating undergoes great growth, particularly during the last few days before dropping from the animal. She becomes fully engorged in from 21 to 66 days after attachment to the host as a seed tick. The male normally remains on the animal the rest of its life.

CAUSE OF THE DISEASE.

9 The primary or direct cause of Texas fever is the microscopic parasite *Piroplasma bigeminum*, belonging to the lowest form of animal life, the Protozoa. In every case of Texas fever these minute parasites are found in the blood. They attack and break down the red blood corpuscles. Their transmission

View.

from the blood of one animal to that of another occurs naturally only through the bite of the cattle tick. The mother tick becomes infected with the Texas fever protozoa by sucking the blood of an infected animal, and this infection is transmitted through the egg and the seed tick to the next animal.

OTHER KINDS OF TICKS.

All ticks do not transmit the parasite which produces tick fever. Texas fever is carried only by the one species, already referred to, viz, *Margaropus annulatus*. Here are shown 10
several kinds, also some of the distinguishing features which they present. Various species of ticks commonly known as wood ticks attach themselves to cattle as well as to many other animals and are often mistaken for fever ticks, which they resemble more or less closely. On close examination, however, some distinctive differences are found. Some of the most marked differences are observed in the shield which is located just back of the head parts. In the wood tick this is comparatively large, and except in one or two species, motley in color, whereas in the fever tick the shield is small and uniformly brown in color. The black-legged tick, 11
the American dog tick, the Lone Star tick (which derives its name from a white or metallic yellow spot on the shield back of the head parts), the brown dog tick, the Rocky Mountain spotted-fever tick, the rabbit tick, the gopher-tortoise tick, and the bird tick are more or less common in various parts of the United States, occurring on cattle, horses, sheep, dogs, rabbits, tortoises, gophers, birds, and other animals, including human beings. Some of them apparently are able to live on almost any host; others are usually restricted to certain animals and are rarely or never found on other hosts.

All these ticks and some others are frequently mistaken for fever ticks by persons who are not familiar with the species, but they do not transmit Texas fever. Those which occur in considerable numbers on live stock are detrimental, however, as they suck blood from their hosts.

LOSSES OCCASIONED BY CATTLE TICKS.

In addition to the reasons already given for the eradication of the cattle tick, there are other losses which should also be 12
taken into consideration, viz, those due to the death of animals from disease; the unthrifty condition, stunted growth, and arrested development occasioned by the parasitic life of the ticks from without and by the blood-destroying and enervating 13

View.

14 effects of the protozoan parasites from within; the decrease in the milk flow; and the low market value of the animals. The loss in weight in southern cattle is evident from the fact that few ticky cattle are fat, practically all being in poor condition when sold at the stockyards. A ticky steer brings from $5 to $10 less than a tick-free steer of the same weight because of the quarantine restrictions and the difference in quality.

Ticks also reduce the value of hides. Hides that have been
15 infested with ticks are usually graded as No. 4 quality, while the same hides if free from ticks, would grade as No. 2. This depreciation averages about $1.25 a hide. The total losses caused by the cattle ticks have been estimated at $50,000,000 a year.

METHODS OF ERADICATION.

In undertaking measures for eradicating the ticks, it is evident that the pest may be attacked in two locations, namely, on the pasture and on the cattle. In freeing pastures the method may be either direct or indirect. The direct method consists in excluding all cattle, horses, and mules from pastures until all the ticks have died from starvation, as the ticks can not live without feeding on the blood of such animals. The other method consists in permitting the cattle and other animals to continue on the infested pastures and treating them at regular intervals with substances destructive to ticks, thus preventing the engorged females from dropping and reinfesting the pasture. The larvæ on the pasture, or those which hatch from eggs laid by females already there, will all eventually perish. Those that get upon cattle from time to time will be destroyed by the treatment, while those which fail to find a host will die in the pasture from starvation.

16 The dipping vat is the most practicable and effective method of applying disinfectants to destroy ticks on cattle. This slide shows the plan for erecting a concrete dipping vat such as is used in cooperative tick-eradication work. Specifications for building this vat will be furnished by the Bureau of Animal Industry on application.

The cattle are dipped in a standard arsenical dipping bath,
17 prepared in accordance with the directions of the Bureau of Animal Industry. In undertaking eradication all the cattle, and also the horses and mules, in case they harbor ticks, are treated regularly every two or three weeks until the ticks have disappeared from the farm. The purpose of the treatment is to destroy all ticks that come on the animals before they have had a chance to mature and drop off, and thus prevent them

View.

from reinfesting the pasture and other portions of the farm. 18
The Bureau of Animal Industry has devised a method of testing the dipping bath in the field in order that inspectors may know at all times that the dip is of proper strength. When the dip is properly prepared and maintained at a proper strength and all cattle are systematically dipped, there is no renewal of infestation of the premises; the cattle simply act as collectors of 19
ticks which are regularly destroyed by the subsequent treatments. Care in frequency of dipping, preservation of a standard dipping solution, and prevention of reinfestation of fields should be closely observed.

It is entirely possible to eradicate ticks, without dipping, by 20
a system of pasture rotation. The time required of course varies considerably, depending on climatic conditions. However, this plan is seldom followed for the reason that cattle owners do not want to give up the use of their pastures for the necessary time. This system is based upon a knowledge of the life history of the tick. The particular scheme of rotation to be adopted rests entirely upon the conditions which have to be 21
met. In Farmers' Bulletin 498 various plans are outlined, designed to free a farm from ticks in from four to eight months. It is known from experiments that engorged females and seed 22
ticks do not crawl more than a few feet in a pasture, but if dropped near a dividing line they may pass from one field to another. Seed ticks might in certain instances during heavy 23
winds be blown from shrubbery across a dividing line from one pasture to another.

ERADICATION ACCOMPLISHED.

This map shows the original quarantined area in 1906, as 24
indicated by the thin red line along the northern border, and also shows the area remaining in quarantine. The white space below the red line represents territory that has been freed of ticks and released from quarantine.

Tick-eradication work is done under State laws and regulations, and by cooperation between the United States Bureau of Animal Industry and the State authorities. An experienced veterinary inspector is placed in charge of the Federal work in each State or other large district to confer with the State authorities and to direct and supervise the work on behalf of the Federal Government. As many Federal, State, and county inspectors are assigned to each locality as are necessary.

In localities where an interest in tick eradication is mani- 25
fested, or where it is especially advisable to take up the

View.

work on account of the location, inspectors confer with the county authorities and interested cattle owners, arrange for meetings, and conduct an educational campaign by distributing literature. Arrangements are then made for the construction of dipping vats in various parts of the county to demonstrate the dipping of cattle to rid them of ticks. Educational and demonstration work is usually conducted throughout one season in order that the cattle owners may become familiar with the work and the cooperation required of them. Conditions should then be favorable for the taking up of systematic cooperative disinfection the next season. It is absolutely necessary that all animals be regularly dipped in order to avoid reinfestation by ticks developing on the cattle and dropping to the ground. Part of the duty of the inspector supervising the dipping is to see that all cattle are brought to the vat on each dipping day.

26 This table shows that on July 1, 1906, there were 933 counties containing 728,543 square miles in the quarantined area; on September 15, 1916, there were 506 counties and 26 parts of counties (434,529 square miles) still quarantined, so that 396 counties and 31 parts of counties (294,014 square miles) have been released. A glance at this table will give an idea as to the amount of work that has been done in the different States. The work is continually progressing, and is usually well advanced in a large territory in addition to that released. Altogether more than 40 per cent of the entire task has been accomplished.

27 We have here a graphic representation showing the comparative area that was quarantined in 1906, and the area that has been released.

NOTE.—The figures and statements here given are of course subject to change as the work
28 progresses. If later figures are available they should be substituted. The lecturer should use a slide and give facts relative to the State in which he is working, and should secure additional figures and obtain information as to local conditions from the inspector in charge of the district in which the lecture is to be delivered in order to bring the subject up to date. For this reason no slide for No. 28, which should be a map showing the tick situation in the State in which the lecture is given, will be sent from the Department of Agriculture. Each lecturer will supply this for his own State.

LIVE-STOCK DEVELOPMENT FOLLOWING TICK ERADICATION.

As soon as tick eradication is accomplished in any locality the next step is to develop the cattle industry. Specially trained men from the United States Department of Agriculture and State institutions work not only with the live-stock associations and other large organizations but to a large extent with the individual cattle owners in an endeavor to promote the

View.

development of the live-stock industry. The introduction of pure-bred animals is advocated and encouraged. Markets for dairy products are established, live-stock organizations are formed, and demonstrations are given in record keeping, the production and care of milk, feeding, the construction of silos and other buildings, castrating, dehorning, marketing, etc.

29 In order to see exactly what tick eradication can accomplish look at these two bulls. The smaller is a 3-year-old scrub, stunted by feeding ticks, and weighing only 460 pounds. The larger one is younger, being 2 years 6 months old when the photograph was taken. He was reared on a farm free of ticks, and weighs 1,135 pounds, nearly three times as much as the scrub bull from the tick-infested territory.

30 Tick eradication pays. When the ticks are eradicated the cattle improve. Take the case of this tick-infested steer weighing 730 pounds. Two months after being dipped, and fed on the same kind of feed as previously, he weighed 1,015 pounds, a gain of 285 pounds.

31 This animal is one of the poor cows in the quarantined area. She is typical of many of those used for milk production throughout the tick-infested district. During one year she produced only 1,508 pounds of milk, containing 88.02 pounds of butter fat, which was worth less than the value of the feed which she consumed during that time.

32 Here is a good cow raised in the South. After the tick has been eradicated such animals as this can be raised, and they give a good profit to the owner. This cow produced 7,757 pounds of milk and 457 pounds of butter fat in one year. It is absolutely impossible to produce good cattle and feed ticks at the same time.

33 Compare the cost of keeping good and poor cows. This picture is no exaggeration but actual fact. These 25 good cows yielded as much profit as the 1,021 poor cows. It is needless to call your attention to the large amount of help needed in the one case and how much is required to take care of the smaller herd, and also the large quantity of feed consumed.

34 Here is a bull that was raised in an area which formerly was one of the worst tick-infested sections in the South. As good cattle can be raised in the South in territory that was formerly tick-infested as in any other portion of the United States. In the early part of the work the owner of this bull was fully convinced that it was impracticable, if not impossible, to raise good cattle under tick conditions.

View.

This is not the only good animal he has. Here is a herd of his pure-bred cattle, showing his success in breeding fine stock.

After tick eradication has been accomplished, the owner of pure-bred cattle in the South can produce herds like this and win prizes at live-stock shows in competition with cattle raisers of the North.

Here are some more cattle from the same herd. It is entirely practicable to raise good cattle in the South after the tick has been eradicated.

The tick takes a heavy toll during its life cycle. Every ounce of blood that goes into the ticks means just so much less for the growth of the animal or for milk. It has been found after careful test that even a slight tick infestation reduced the milk flow 18 per cent, while a heavy infestation cut it down as much as 42 per cent.

A dairyman in a heavily infested territory dipped his herd of 42 cattle. One week after dipping the cows gave 10 gallons of milk a day more than before, an increase of 16.6 per cent. The milk sold for 35 cents a gallon, so that after one dipping he got $3.50 more per day from his herd. He had begun to feed the cows instead of the ticks.

In counties which have been released from quarantine because of eradication of the cattle tick, better breeding bulls have been shipped in, and the cattle have improved in quality and advanced in price. Small farmers who have not cows enough to justify their purchasing good, pure-bred bulls may cooperate by organizing societies for the joint purchase, for community use, of pure-bred sires.

Cattle raisers and dairymen in the sections of the South where tick eradication has been accomplished are also finding it to their advantage to add one or more good, pure-bred cows to their herds. They are thus enabled in much less time, with the aid of a good bull, to breed a herd of fine animals. Bull calves from such cows find a ready sale for a good price, while the heifer calves are retained to increase and improve the home herd.

Nor are cattle the only animals which tick eradication helps. Farmers having an increased milk supply are enabled to feed more and better skim milk to their hogs, and with the realization of the advantages gained by the improved condition of the cattle comes a general desire for better farm animals, a desire which may be realized by the financial aid obtained from the improved condition of their cattle.

View.

With tick eradication accomplished, the dairy farmer has to provide feed and the way to keep it. Silos are being constructed. Good barns follow as a matter of course, and the entire farm takes on an air of prosperity. The farmer takes pride in showing his animals and his equipment. His bank account shows a substantial improvement, his children have better schooling, the housewife can afford many devices to help her in her household work.

The benefits following tick eradication are numerous and far-reaching. Restrictions on the shipment of cattle are removed; the loss from Texas fever is eliminated; the cattle industry is promoted, and other agricultural conditions in that locality thrive; in appearance the cattle show a marked contrast with those which harbored the ticks; pure-bred cattle can be brought in from other sections to improve the native breed without danger of death from Texas fever; and southern animals can enter the show rings of the North without restriction. Furthermore, the total cost of tick extermination will be far less than the amount saved in the first year after it is accomplished.

WHAT THE GOVERNMENT WILL DO.[1]

The United States Department of Agriculture stands ready to assist by sending its experts to help you and your county organize to fight the tick, by supplying plans for and supervising the construction of dipping vats and by detailing a field expert to supervise the dipping in localities where cooperative work is taken up. The department, however, can not pay the whole cost. The State should and the county and its people must help by doing their share. The local people will get the profits, except that the entire Nation profits from the increased prosperity of any of its parts. Get your neighbor interested and get him to help you interest his neighbor. Soon the county will be interested, then the next county, after which the State will take a hand. Write to the Secretary of Agriculture, Washington, D. C., for advice on how to get rid of the ticks.

[1] This paragraph is intended for communities where tick eradication has not been begun and where it is desired to arouse interest. It may of course be modified to suit local conditions.

APPENDIX.

LANTERN SLIDES.

No. of view.

1. Animal suffering from tick fever.
   Common condition in the South.
   Annual loss about $50,000,000 from boarding the tick.
2. Ticks on hide.
   Eradication practical and possible.
3. Engorged female tick.
   Life history of *Margaropus annulatus*.
4. Tick laying eggs.
   Lays from a few hundred to more than 5,000 eggs.
5. Larvæ or seed ticks.
   Describe appearance.
   Vitality before finding host.
6. Nymph.
   First molting, adding pair of legs.
   Second molting, sexually mature tick.
7. Male tick.
   Does not increase materially in size.
8. Female tick.
   Rapid growth before dropping from animal.
9. Texas-fever microorganism.
   Parasite found in blood in every case of Texas fever.
   Inoculation only through bite of tick.
10. Texas-fever tick—male; female in three stages.
    Texas fever caused only by *Margaropus annulatus*.
11. Other kinds of ticks.
    These ticks do not produce tick fever.
    Wood tick.
    Black-legged tick.
    American dog tick.
    Lone Star tick.
    Brown dog tick.
    Rocky Mountain spotted-fever tick.
    Rabbit tick.
    Gopher-tortoise tick.
    Bird tick.
12. Cow dying from Texas fever.
13. Cow heavily infested with ticks.
    Effect of tick as a parasite.
14. Cow heavily infested with ticks.
15. Hide damaged by tick infestation.
    Difference in grade of such hides.
    Big money loss.

No. o
view.

16. Plan of dipping vat.
Secure specifications from Bureau of Animal Industry.

17. Cattle-dipping vat.
Construction of vat.

18. Cattle-dipping vat.
Description of dip.
Regular dipping.

19. Cattle-dipping vat.
Drop to hold cattle in vat.

20. Plan of pasture rotation.
Seldom followed, but practicable.

21. Plan of pasture rotation.
Fully outlined in Farmers' Bulletin 498.

22. Plan of pasture rotation.

23. Plan of pasture rotation.

24. Map showing quarantine line.
How work is done under cooperation.

25. Cattle-dipping vat.
Importance of dipping vat in tick eradication.

26. Progress in tick eradication, 1906 to 1916.
Over 40 per cent released to September 15, 1916.
Call attention to figures for State in which lecture is given.

27. Progress in tick eradication.

28. Map of State in which lecture is given.

29. What can be accomplished by tick eradication.
Difference between animal stunted by ticks and one grown in free area.

30. Tick eradication pays.
Result of dipping steer, gain in weight.

31. A poor cow from the quarantined area.
Production for one year, 1,508 pounds of milk, 88.02 pounds butter fat. Less than value of feed.

32. A good cow raised in the South.
Produced 7,757 pounds of milk, containing 457 pounds butter fat.
Impossible to raise good cows and ticks.

33. When the cows come home.
Takes 1,021 cows averaging 133½ pounds of butter fat per year to return same profit as 25 cows averaging 301 pounds of butter fat per year.

34. Pure-bred bull raised in area which was once worst tick-infested area in South
Impossible to raise good cattle under tick conditions.

35. Herd of pure-bred cattle in free area.

36. Prize-winning herd.

37. Pure-bred cattle grazing.

38. Three milk cans.
Every ounce of blood taken by ticks reduces milk flow. Gain experienced by dairymen after one dipping.

39. More fine pure-bred cattle.

40. Pure-bred bull.
General improvement in live-stock industry after eradication of ticks.

41. Pure-bred steer.
Advance in price of cattle as result of work.

42. Pure-bred cow.
Advantage of adding pure-bred cow to herd.

43. Pure-bred cow.

No. of view.

44. More and better skim milk for hogs.
45. Better animals on the farm as result of eradication work.
46. Silo necessary for feeding animals on farm.
47. Fine dairy barn.
    Improved buildings as result.
48. Another type of barn.
    Pride in farm buildings as result of better financial condition.
49. Benefits of tick eradication.
50. Department circulars and bulletins.
    Department will help fight tick.

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